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CENTRAL FAX CENTER Attorney Docket No. 740756-2694
Serial No. 10/757,459
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REMARKS

The Office Action of April 5, 2006 was received and carefully reviewed. Reconsideration and withdrawal of the currently pending rejections are requested for the reasons advanced in detail below.

Claims 1-32 and 35-42 were pending prior to the instant amendment. By this amendment, claims 1-2 and 36 have been amended, new dependent claims 43-48 have been added. Claims 33-34 have been canceled previously, and claims 3, 6, 9, 17, 20, 23, 26, 29, 32, 35 and 41 have been withdrawn. Accordingly, claims 1-2, 4-5, 7-8, 10-11, 13-16, 18-19, 21-22, 24-25, 27-28, 30-31, 36-40, and 42-48 are pending for consideration, of which claims 1-2 and 36 are independent.

In the detailed Office Action, claim 1 stands rejected under 35 U.S.C. §102(b) as being anticipated by Sasaki et al. (U.S. Publication No 2001/0004281 – hereafter Sasaki) in view of Gyoda (U.S. Patent Publication No. 2002/0063842 – hereafter Gyoda). Further, claims 4-5 stand rejected under 35 U.S.C. §103(a) as unpatentable over Sasaki in view of Gyoda and further in view of Marumoto (U.S. Patent No. 6,277,529 – hereafter Marumoto). Still further, claims 7 and 8 stand rejected under 35 U.S.C. §103(a) as unpatentable over Sasaki in view of Nishiguchi et al. (U.S. Patent No. 6,226,067 – hereafter Nishiguchi). Still further, claims 13-14 stand rejected under 35 U.S.C. §103(a) as unpatentable over Sasaki in view of Gyoda and further in view of Inoue (U.S. Patent Publication No. 2003/0090609 – hereafter Inoue). Still further, Still further, claims 15-16 and 18-19 stand rejected under 35 U.S.C. §103(a) as unpatentable over Sasaki in view of Gyoda and Inoue and further in view of Inou et al. (U.S. Patent No. 6,639,647 – hereafter Inou). Still further, claims 30-31 stand rejected under 35 U.S.C. §103(a) as unpatentable over Sasaki in view of Gyoda and further in view of Yokono et al. (U.S. Patent No. 4,773,737 – hereafter Yokono). These rejections are respectfully traversed at least for the reasons provided below.

Initially, Applicants note that the rejection of claim 1 as anticipated by Sasaki and Gyoda appears to be a rejection of claims 1-2, 10-11, 21-22, 24-25, 27-28, 36-40 and 42 under 35 U.S.C. §103(a), as the rejection is based on a combination of two references. Further, the Examiner rejections withdrawn claim 26 while failing to address claim 28. Accordingly, Applicants will treat the above-mentioned discrepancies in the Office Action as

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typographical error and will respond to the rejection of claims 1-2, 10-11, 21-22, 24-25, 27-28, 36-40 and 42 as an obviousness rejection.

With respect to the rejection of independent claims 1 and 2, the Examiner asserted that Sasaki, the primary reference in all of the pending rejections, disclose all the features of these claims except for claimed discharging a plurality of droplets by inkjet. The Examiner then relied upon Gyoda for curing the deficiency of Sasaki, since Gyoda allegedly discloses discharge of a liquid crystal layer by inkjet. In response, Applicants respectfully submit that the present invention as recited in the amended claims is directed to forming the seal material layer and the liquid crystal by ink-jet.

To further distinguish the presently claimed invention over Sasaki, Applicants have amended claim 1, as shown above, to further recite "forming a seal material layer that surrounds a pixel area provided on a first substrate by ink-jet". Further, Applicants have amended claim 2, as show above, to further recite "forming a first seal material layer that surrounds a pixel area provided on a first substrate by ink-jet; and forming a second seal material layer on a second substrate by ink-jet".

With respect to independent claim 36, Applicants have amended claim 36 to further recite "a filler material including a resin" in order to further distinguish the present invention over Sasaki. Support for the feature wherein a space between the first and second seal materials be filled with a filler material such as a resin can be found at least on, e.g., page 5, lines 17-18 of the specification. In contrast with Applicants' claimed invention, Sasaki discloses that a space 21 between the first and second seal materials is a vacuum space, and Sasaki appears to fail to teach, disclose or suggest a filler material including a resin.

The requirements for establishing a *prima facie* case of obviousness, as detailed in MPEP § 2143 - 2143.03 (pages 2100-122 - 2100-136), are: first, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference to combine the teachings; second, there must be a reasonable expectation of success; and, finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. As Sasaki is deficient, as discussed above, the application of Sasaki, alone or in combination with the other cited secondary references in all of the pending obviousness rejections, is improper.

New dependent claims 43-48 have been added to further complete the scope to which Applicants are entitled.

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With reference now to the IDS submitted June 24, 2004, Applicants attached herewith a courtesy copy of JP 57-124827 to Watanabe (08-04-1982), which was noted in the Office Action of April 5, 2006 as "Not found in file as of 3/31/05" and was not considered by the Examiner. Accordingly, Applicants respectfully request the Examiner to consider the reference and initial the submitted form PTO-1449.

In view of the foregoing, it is respectfully requested that the rejections of record be reconsidered and withdrawn by the Examiner, that claims 1-2, 4-5, 7-8, 10-11, 13-16, 18-19, 21-22, 24-25, 27-28, 30-31, 36-40 and 42-48 be allowed and that the application be passed to issue. If a conference would expedite prosecution of the instant application, the Examiner is hereby invited to telephone the undersigned to arrange such a conference.

Respectfully submitted,



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Application Date: January 27, 1981

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SPECIFICATION

1. Title of the Device:

LIQUID CRYSTAL DISPLAY DEVICE

2. Claims

(1) A liquid crystal display device, comprising: two insulating substrates where a display electrode and a counter electrode are disposed opposite to each other; a lead electrode

conducting with the respective electrodes and drawn out to the end part of at least one insulating substrate; a lead fitting connected to the lead electrode; a conductive agent provided between the lead electrode and the lead fitting; a mold agent wrapping the lead fitting, conductive agent and the end part of the substrate; and liquid crystal sealed between both insulating substrates, wherein the conductive agent is a mixture of an organic adhesive and conductive particles, and has elasticity.

(2) The liquid crystal display device according to claim 1, wherein the organic adhesive is not compatible with the mold agent.

(3) The liquid crystal display device according to claim 1 or 2, wherein the mold agent is mainly composed of an epoxy adhesive, and the organic adhesive is mainly composed of a silicone adhesive.

3. Detailed Description of the Invention

This invention relates to a liquid crystal display device and particularly to a lead fitting for an external connecting terminal connected to an electrode, and it is an object of the invention to keep a favorable state without causing a defect in connection even in a long-time use and prevent deterioration of characteristics of the display device.

Fig. 1 shows an example of a liquid crystal display device. Insulating substrates 1, 2 where a display electrode and a

counter electrode are formed respectively are disposed opposite to each other, and liquid crystal is sealed (not shown) between the upper and lower insulating substrates spaced from each other as designated by a spacer. The respective electrodes on the substrate are drawn out to the end part of at least one insulating substrate by a lead electrode, and from the lead electrode, a lead fitting 3 of an external connecting terminal for connection with an external circuit is electrically and mechanically connected. When voltage is applied through the lead fitting to the lead electrode, the voltage is applied between both electrodes to vary electro-optical property of liquid crystal so that a desired display pattern is obtained.

Fig. 2 shows the condition of mounting the lead fitting of this type. That is, the lead fitting 3 has the head part formed like a U-shape to be connected to the lead electrode 4 on the end part of the substrate 2, thereby clamping the end part of the insulating substrate to be connected to each other. Further, for the purpose of supplementing electrical conductivity of the lead electrode and the lead fitting, a conductive agent such as silver-contained epoxy adhesive 5 is used. In order to improve connection and fixing of the lead fitting 3 to the end part of the substrate, mechanical adhesion is increased, and in order to protect a lead fitting connecting part as an electric connecting part from an external atmosphere, it is molded with a mold agent 6 such as epoxy resin.

When the liquid crystal display device is thus formed, fixing of the lead fitting is favorable and electric connection is good. When it is molded with the mold agent to fix the lead fitting, however, the spring property of the connecting part at the tip of the lead fitting is lost. When the display device is used and then a long period of time elapses, the mold agent expands, and especially when moisture is adsorbed from an external atmosphere to the mold agent, the mold agent is swollen to move the lead fitting. The mold agent expands in the direction of the arrow in Fig. 3, for example, so the lead fitting is deteriorated in connection to the lead electrode, to cause imperfect electric connection. Although the conductive agent has been used in order to compensate for such defect, the conventional one is gradually solidified with the passage of time after application and becomes plastic. Consequently, the defect is not caused at the start in the above swelling of the mold agent, but with the passage of time, the conductive agent, as shown in Fig. 4, comes off or cracks so that connecting failure between the lead electrode and the lead fitting is frequently caused.

The invention has been made in the light of such circumstances and it provides a liquid crystal display device in which an external connecting terminal keeps favorable connection with a substrate as designated not to deteriorate characteristics even if a mold agent is swollen after the lapse

of long time.

An embodiment of the invention will now be described with reference to the attached drawings. As shown in Fig. 5, a conductive agent 11 made by mixing a silicone adhesive as a binder with carbon is applied to a part of a substrate 2 to which a lead fitting of a lead electrode 4 is connected, then the lead fitting 3 is mounted, and further molded, covering it with a mold agent formed of an epoxy adhesive 12. The conductive agent 11 is rubber-like and has elasticity, and it is neither solidified with the passage of time nor compatible with the mold agent 12. Accordingly, even if the mold agent is swollen so that the lead fitting is moved to separate from the substrate in a long-time use, the mold agent flows following the movement to gradually enter between the lead fitting and the lead electrode to prevent electric connection failure between the lead fitting and the lead electrode.

The conductive agent thus interposed between the lead fitting and the lead electrode is a mixture of conductive particles such as carbon and an organic adhesive such as a silicone adhesive, and has elasticity. The organic adhesive is not compatible with the mold agent, so that the contact failure between the lead fitting and the lead electrode, which has been caused with the passage of time, can be prevented in the invention. Accordingly, although it has been frequent in the conventional liquid crystal display device that the lead fitting is perfectly

fixed when the device is formed, but with the passage of time, the connection failure between the lead fitting and the lead electrode is caused, the occurrence of such defect can be prevented, deterioration of characteristics can be prevented, and a favorable display pattern as designated can be always obtained in the invention.

Even if a mold agent formed of an acrylic adhesive is used as a mold agent as well as the above, this is not compatible with the above conductive agent, so that even if the mold agent is swollen, the electric connection failure between the lead fitting and the lead electrode can be prevented. It goes without saying that the similar effect can be produced by using not only the above conductive agent and mold agent but also suitable ones according to the gist of the invention, and the thus obtained display device is useful to the industries.

4. Brief Description of the Drawings

Fig. 1 is a perspective view of a liquid crystal display device;

Fig. 2 is a sectional view showing a connecting part of a lead fitting of a liquid crystal display device;

Fig. 3 is a schematic diagram showing the swelling state of a mold agent;

Figs. 4A and 4B are schematic diagrams showing the defective state of a conductive agent; and

Fig. 5 is a sectional view showing the principal part

of one embodiment of the invention.

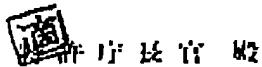
2: insulating substrate 3: lead fitting of external
connecting terminal 4: lead electrode 11: conductive agent
12: mold agent

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実用新案登録願 (2)

56. 1. 27



1. 本案の名称

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方式
審査124827
56 009149

明 紹 書

1. 考案の名称

液晶表示装置

2. 実用新案登録請求の範囲

(1) 互に表示電極と対向電極とが対向して配置される2枚の絶縁基板と、各々の電極に導通し少なくとも1方の絶縁基板の端部に引出されるリード電極と、このリード電極に接続されるリード金具と、前記リード電極とリード金具との間に設けられる導電剤と、前記リード金具、導電剤および基板端部を包むモールド剤と、前記両絶縁基板間に封入される液晶とを具備した液晶表示装置において、前記導電剤は有機接着剤と導電性粒子との混合であつて弾性を有してなることを特徴とする液晶表示装置。

(2) 有機接着剤はモールド剤と相溶しないことを特徴とする実用新案登録請求の範囲第1項記載の液晶表示装置。

(3) モールド剤はエポキシ系接着剤を主成分とし、有機接着剤はシリコン系接着剤を主成分とする

(1)

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ることを特徴とする实用新案登録請求の範囲第1項又は第2項記載の液晶表示装置。

3. 考案の詳細な説明

本考案は液晶表示装置に属し、特に電極に接続される外部接続端子用のリード金具が、長期にわたって使用されても接続に不具合を生ずることなく良好な状態を保ち、表示装置の特性劣化をおこさないことを目的とする。

液晶表示装置の1例を第1図に示す。表示電極と対向電極のそれぞれ形成された絶縁基板(1)、(2)が互に対向して配置され、スペーサに上つて所定の間隔を保持して、これら上下絶縁基板間に液晶が封入されている(図示せず)。基板上の各々の電極はリード電極によつて少なくとも一方の絶縁基板の端部に引出され、このリード電極から外部回路と接続するため外部接続端子のリード金具(3)が電気的かつ機械的に接続されている。前記リード電極には前記リード金具を介して電圧を加えることにより両電極間に電圧が加えられることによって液晶の電気光学的性質を変化させて所望の表

(2)

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示ペターンが得られるものである。

このようなリード金具が取着されている状態を第2図に示す。すなわちリード金具(3)は基板端部のリード電極(4)に接続するため頭部がコの字形に形成されていて、絶縁基板端部をはさみこんで接続している。さらにリード電極とリード金具との導電性を補う目的から導電剤たとえば銀入りエボキシ系接着剤(5)が用いられ、又、リード金具(3)の基板端部との接続固定を良好にするため機械的付着力を増強し、かつ電気的接続部としてのリード金具接続部を外部雰囲気から守るためにエボキシ樹脂などのモールド剤(6)でモールドしている。

このようにして液晶表示装置が形成されればリード金具の固定は良好で、電気的接続もよいか、モールド剤でモールドし固定されるとリード金具の先端の接続部のはね性は失われることになる。表示装置が使用され長期間経過すると、モールド剤の膨張、特にモールド剤に外部雰囲気中から水分の吸着があるとモールド剤が膨潤してリード金具を動かすことになる。たとえば第3図の矢印に

(3)

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示すように膨張することになり、リード金具はリード電極との接続が悪くなつて電気的の接続が不十分になつてくる。このような不具合を補うためにも導電剤が用いられているものであるが、従来のものは塗布してのち時間がたつにつれ固化し、塑性化していた。したがつて前記のようなモールド剤の膨潤時には最初のうちは不具合を起さないが、時間の経過と共に導電剤は第4図に示すように割れたり、割れたりなどするようになつて、結局リード電極とリード金具との接続不良が発生することが多かつた。

本考案はこれらの点にかんがみをされたものであつて、たとえ長時間経過してモールド剤が膨潤するようなことが起つても、外部接続端子が所定通り基板のリード電極と良好な接続を保ち特性を劣化させない被膜表示装置を提供するものである。

以下図面を参照して本考案の実施例について説明する。第5図に示すように基板(2)のリード電極(4)のリード金具が接続される部分にカーボンシリコン系接着剤をペインダとして混合した導電剤

(4)

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印を塗布してのちリード金具(3)を挿着し、さらにこれをおおつてエポキシ系接着剤なるモールド剤でモールドする。前記導電剤印はゴム状をして弾性を有し、時間の経過と共に固化することなく、かつモールド剤印とも相溶しないものであるので、長期にわたつて使用したときにモールド剤がたとえ膨潤してリード金具が基板から離れるようになつてもこの移動に追随して運動し、リード金具とリード電極との間に侵入して行き、リード金具とリード電極との電気的接触不良を防止するものである。

このようリード金具とリード電極間に介在させる導電剤はカーボンのような導電性粒子とシリコン系接着剤などの有機接着剤とが混合されたもので、弾性を有しかつ前記有機接着剤はモールド剤と相溶しないものであるため、時間の経過とともに発生していたリード金具とリード電極との接触不良は、本考案のものでは防止することができる。したがつて従来の液晶表示装置では、形成されたときにはリード金具が十分に固定されたもの

(5)

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が得られているが、時間の経過と共にリード金具とリード電極との接続不良が発生することが多かつたが、本考案のものでは、このような不具合の発生を防止することができ特性の劣化をおこすことなく、良好な所定通りの表示パターンが常に得られるようになつた。

またモールド剤として前記のもののほか、アクリル系接着剤からなるモールド剤を用いても、このものは前記導電剤とは相溶せずモールド剤が膨潤してもリード金具とリード電極との電気的接続不良を防止することができる。なお前記した導電剤・モールド剤ばかりでなく、本考案の要旨にしたがつて、それぞれ適切なもの用いて同じような効果を示すことはいうまでもなく、このようにして得られた表示装置は工業的に有用なものである。

4. 図面の簡単な説明

第1図は液晶表示装置の斜視図、第2図は液晶表示装置のリード金具の接続部を示す断面図、第3図はモールド剤の膨潤状態を示す説明図、第4

(6)

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図(A), (B)は導電剤の不具合状態を示す説明図、第
5図は本考案の一実施例の製部を示す断面図であ
る。

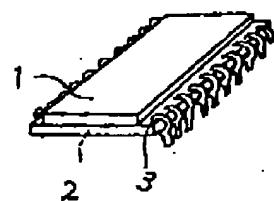
2…記録基板、3…外部接続端子のリード金具。
4…リード電極、11…導電剤、12…モールド剤。

代理人 弁理士 井 上 一 男

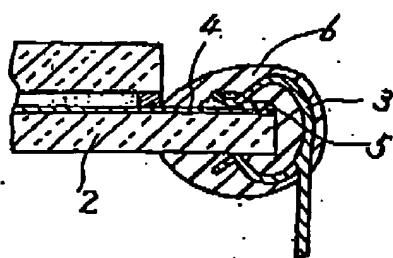
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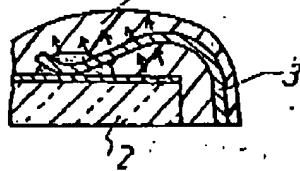
第 1 図



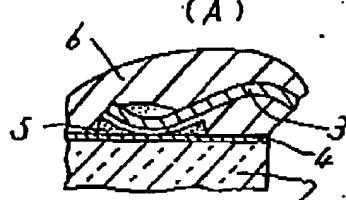
第 2 図



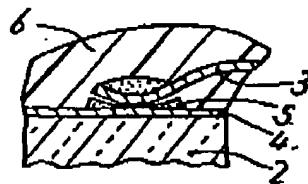
第 3 図



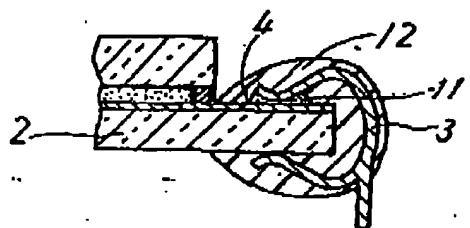
第 4 図



(B)



第 5 図



4827

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5. 添付書類の目録

(1) 委任状	1通
(2) 明細書	1通
(3) 図面	1通
(4) 顧客副本	1通

6. ~~同上~~
~~同上~~

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